GENERAL

This section addresses specifically the standard specification for Quality Management Program, Asphaltic Mixture.

The Quality Management Program for Hot Mix Asphalt (HMA) is detailed within the WisDOT Standard Specifications. The following information is provided as additional reference and interpretation for procedures outlined in those specifications.

Overview - WisDOT Quality Management Program Requirements

- Personnel Requirements
- Laboratory Requirements
- Random Sampling and Sampling Frequency
- Required Testing (and Calculated Properties)
  - Mixture Bulk Specific Gravity (Gmb)
  - Mixture Maximum Specific Gravity (Gmm)
  - Air Voids (Va)
  - VMA
  - Aggregate Gradation
  - Percent Binder Content
- Documentation
  - Records
  - Control Charts
- Control Limits
- Warning Bands
- Job Mix Formula Adjustments
- Corrective Action
- Optional Contractor Assurance
- Verification Program

The following sections identify and further attempt to explain those procedures used during field production of HMA under the Quality Management Program.

DEFINITIONS:

Rule of Retained: Split samples for comparison testing will be retained. In order to test a retained portion of any sample, notification must be given from the requesting team to the QV team (and QC team if applicable). The department has ownership of QMP required split samples. There is implied

joint ownership, between contractor and department, on any additional QC samples taken.

Limiting Liability: defining satisfactory material not subject to price reduction based on product quality verification (does not exclude price reductions within contractor QMP).

Mixture production days: days of production of a specific design mixture being tested under QMP. No more than two working days is intended for getting test results.

Working days: Calendar day, except Saturdays, Sundays and department specified holidays.

Unsatisfactory materials: mixture not meeting Acceptable Verification Parameters, but allowed to be left in place with appropriate payment reduction.

Unacceptable materials: mixture not meeting Acceptable Verification Parameters and being required to be removed and replaced.

Teams: personnel listed on QMP organizational charts.

PERSONNEL REQUIREMENTS (THROUGH HTCP)

QC – Production Process
Sampling and Testing : HMATech 1 (Field Product Testing)
Production Process Changes : HMATech 2 (Production Process Control)
Mix Design : HMATech 3 (Mix Design)

CA – Production Assurance”
Sampling and Testing : HMATech 1 (Field Product Testing)
Production Process Changes Review : HMATech 3 (Mix Design)

QV – Department Quality Verification
Sampling and Testing : HMATech 1 (Field Product Testing)
Production Process Change Review : HMATech 3 (Mix Design)

LABORATORY REQUIREMENTS

- Must be furnished with equipment to comply with specification requirements (calibrated testing equipment, phones, faxes, copy machines, etc.)
- Must be at the plant site and operational prior to production
- Wisconsin Laboratory Qualification Program participant (for acceptance sampling and testing.
- Any laboratory producing test data, to comply with QMP requirements, must have a Superpave Gyratory Compactor (SGC). The intent is for the Gmm and Gmb materials to be tested at the same facility.

CA Lab

Separate set of equipment used (inclusive of SGC) if QC testing on same design mixture is being conducted within that facility.

SAMPLING HOT MIX ASPHALT

At the beginning of each day the contractor shall specify the anticipated tonnage to be produced. The frequency of sampling is then determined from latest (QMP) HMA Mixture" specification. The anticipated tonnage is divided into equal increments and a sample is obtained randomly from each increment.

Example for Expected Production of 1900 tons per Day:

Number of Samples per day = 3 (per QMP specification)
Increment = 633 tons (days production divided by required samples)
Sample 1 – From 50 to 633 ton
Sample 2 – From 634 to 1267 ton
Sample 3 – From 1268 to 1900 ton

The approximate location of each sample within the increments is determined by selecting random numbers using ASTM Method D-3665 or by using a calculator that has a random number generator. The random numbers selected are used in determining when a sample is to be taken and shall be multiplied by the tonnage increments defined for the day. This number shall then be added to the final tonnage of the previous increment to yield the approximate total tonnage of when the sample is to be taken.

To allow for plant start-up variability, the procedure calls for the first random sample to be taken at 50 ton or greater per production day (not intended to be taken in the first two truck loads).

Example:

Required Sample	Tonnage Range	Random No ASTM D-3665	Increment * Random No	Prev. Increm	Final Sample Tonnage
1	50 - 633	0.572	362	0	362
2	634 - 1267	0.353	223	633	856
3	1268 - 1900	0.656	415	1267	1682

This procedure is to be used for any number of samples per day.

In the event that actual daily production exceeds projected daily tonnage, the original increment will remain the same and additional samples will be randomly taken from each ensuing increment.

If production doesn't allow attaining the next randomly generated sample, then a non-random (arbitrary) sample will be taken to fulfill the increment testing requirement.

It's intended that the plant operator not be advised ahead of time when samples are to be taken. If the plant operator is involved in recording a Pb (%AC) to match up with the mix sample tonnage, then notification need not be earlier than 60 minutes prior to the mix sample being taken.

If belt samples are used during troubleshooting, the blended aggregate shall be obtained when the mixture production tonnage approximates the sample tonnage. For plants with storage silos, this could be up to 60 minutes in advance of the mixture sample that's taken when the required tonnage is shipped from the plant.

QC Sample

- Sample size only requires one “test” portion and one “retained” portion.

CA Sample

- Must be a companion/split sample with QC (for direct data comparison)
- If an arbitrary CA sample is taken, the companion split must be tested by the QC team in order to be considered for limiting liability

QV Sample

- Must be directly observed by the engineer
- Engineer takes immediate possession
- The initial split (QV / QV-retained) can be performed by using a quartermaster. If the contractor performs this split, the engineer, prior to taking possession, must directly observe it.

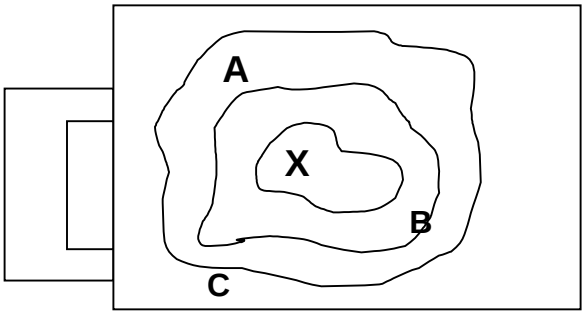
Sampling From the Truck Box

Sampling shall be the contractor's responsibility. The truck box sampling presents some safety hazards because it is necessary to climb atop the truck box and stand on the hot mixture while sampling. Special care should be exercised by the contractor or his designated representative as the sample is procured to prevent falls or burns.

Sample Device. The shovel or other sampling device shall be of such size and configuration that each increment of a sample can be obtained in one attempt without spilling or roll off. In order to satisfy this requirement with a flat bottom shovel, it is necessary to attach 2- to 4-inch vertical sides to the shovel.

Sample Location in Truck

When the last batch has been dumped into the truck box, establish a reference point on the surface of the load, either at the high point, if a conical shape exists, or near the middle of the truck box if the surface shows no such conical shape. Then establish at least three incremental sample points about midway between the previously established point and the sides if the truck and equally spaced around the load (see sketch). At these sampling points, remove the upper two to three inches of mixture, and then insert the sampling shovel or other approved device into the mixture to extract the sample increments and place increments in a sample container.



The total sample for a 12.5 mm mix shall weigh at least 70lbs (32kg).

X = high reference point

A = sample point
B = sample point
C = sample point

Figure 1 Truck Box Sampling

QC Sample Sizes

- The total sample:

Mixture	Sample Size
9.5 mm – 12.5 mm	70 LB
19 mm – 25 mm	100 LB
25 mm - 37.5 mm	160 LB

- The total sample for larger NMAS (nominal maximum aggregate size) mixtures will be enough to provide the required minimum testing sample size as defined in Figure 3.
- The “retained” split must be half of the QC sample

CA Sample Sizes

- Test sample size may vary based on the tests chosen, but still needs to be large enough to accommodate a split for parallel testing and data comparison.

QV Sample Sizes

- Use same guidance as QC Sample Size.

SAMPLE IDENTIFICATION

The contractor is responsible for obtaining and splitting samples. When the sample is an aggregate sample it shall be split, placed in bags with plastic liners and labeled as directed below.

When a mixture sample is procured, it shall be quartered, place in a bag and labeled as directed below. The label shall include:

1. Contractor
2. QC, QC-ret, QV, QV-ret
3. State Project ID
4. Date
5. Sample Number
6. Type of Asphaltic Mixture
7. State Mix Design ID (250-XXXX-YR)
8. Percent Binder
9. Daily Tonnage Sampled
10. Current Gsb

ABC Paving, Inc
QC
Prj. ID : 1152-01-70
7 / 15 / 01 sple 8–2
E – 3 12.5 mm
250-0125-2001
5.5% AC
current Gsb: 2.722
1,206 ton (day’s)

Figure 2 Example of Sample Labeling

Note: Accumulative/total tons, representing mix design production is to be recorded on the QC data sheets.

Reduction of HMA Samples to Testing Size

For QC sample reduction the HMA sample in the containers is mixed and quartered. The quartering process shall then proceed as follows:

Step 1. Quarter the sample into "Test" and "Retained" samples. Place entire sample on table, quickly re-mix and quarter to minimize temperature loss. Quarter the Test & Retained samples as shown on the sketched example. For 12.5mm mixes start with at least a total of 70lbs (32kg) of HMA (see Figure 3).

Superpave Sample
70lbs
(32kg)

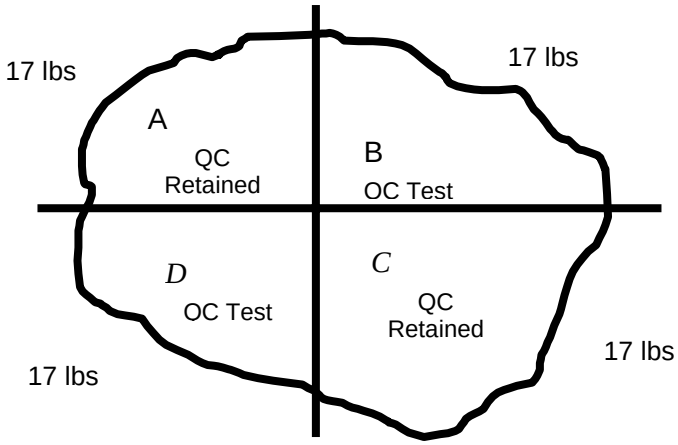


Figure 3

Diagonal quarters, as indicated on the sketch, shall be combined to form the Retained sample (A + C) and the Test sample (B + D). The Retained sample is bagged, labeled and stored in a safe dry place. The Retained samples may be tested using the "Rule of Retained."

The Test sample (B + D) is then further quartered for the specified tests. Continue the quartering process in Step 2 for the Test materials until individual samples are in the oven.

Step 2. The 35 lbs (17 kg) of HMA material for testing, from Step 1, is to be further reduced for testing according to the following sketch (see Figure 4).

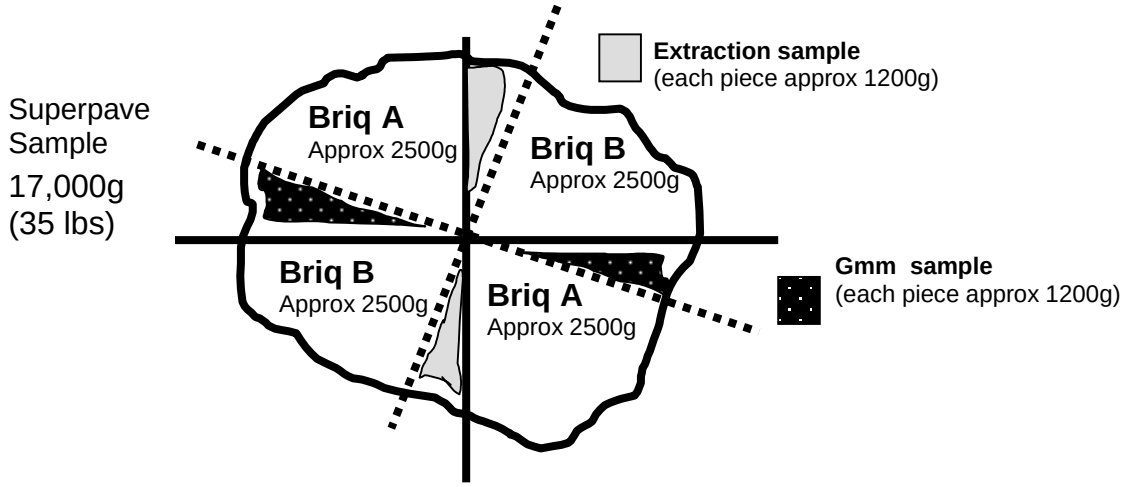


Figure 4

Gmm (RICE) Sample Size – T209	
37.5 mm	4000 grams
25.0 mm	3000 grams
19.0 mm	2000 grams
12.5 mm	1500 grams
9.5 mm	1000 grams
4.75 mm	1000 grams

DOT 1560 Extraction Sample Size –T164	
37.5 mm	4500 grams
25.0 mm	2500 grams
19.0 mm	2000 grams
12.5 mm	1500 grams
9.5 mm	1000 grams
4.75 mm	1000 grams

Figure 5. *MINIMUM TESTING SAMPLE SIZES*

NOTE: For QV (and some CA) samples: a Solvent Extraction Gradation (WisDOT 1560) isn't required, so when quartering, the skewed areas may be smaller in size but all four pieces are combined for the Rice Test (Gmm).

Use of Alternative Quartering Devices (Quartermaster)

Use of other devices to assist in the quartering procedures may be used with approval of the Department. The Quartermaster is one such device and may be used for the initial two splits of the HMA (to process the QC & QA split, as well as the QC Test & QC Retained split). The technician shall perform the third split of the sample, to reduce it to testing size, according to step 3 of the procedure describe.

Ex: 1.) Dump initial samples into the machine (note capacity limit). 2.) Throw lever to allow material to flow into the four quartering buckets. Repeat until all material has been quartered. 3.) Combine diagonally opposite buckets to form the QC sample (A + C) and the QA sample (B + D) making sure to distribute any clinging fines into each bucket . **4.)** To further split the QC sample for testing and retained portions, dump buckets A and C back through the machine (having reset the shelf lever). Reset the buckets and throw lever allowing the material to be dispersed. Again combine diagonally opposite buckets to form the QC testing sample and the QC retained sample. **5.)** From this point, remove the QC test material to a heated splitting table for further reduction. **6.)** Clean sides and quartering slats prior to next use.

REQUIRED TESTING AND CALCULATED PROPERTIES

QC Tests

QC testing must be completed, and data posted, on the day the sample was taken.

CA Tests

CA tests, as listed in the CA Testing subsection, are at the contractor's option.

The contract language mentions "two working days after the sample has been obtained by the contractor" as the time within which the CA personnel must respond to the QC team relative to the agreement of data results. The intent is to provide information and feedback to the QC team as soon as practical in case there is data disagreement. The interpretation is to mean that the time starts when the QC team procures the sample (ex: a QC/CA sample obtained on day 4 and intended to be tested, would need to be selected by CA on day 4, 5 or 6, with results reported no later than day 6).

If CA testing is being performed by the department, as part of determining, Specification Section 460.2.8.3.1.6, "Acceptable Verification Parameters (paragraph 3)", the type of testing will be mutually agreed on by the contractor and the engineer, and the CA personnel shall make every effort to pick-up the sample on the day the QC personnel procures the sample intended to be tested.

If a QC-retained (CA) mixture sample temperature is 230F (110C) or higher when delivered to the testing facility, quartering may start immediately. If the temperature is below 230F (110C), place in a 250F (121C) oven, until workable for quartering, not to exceed two hours.

If the difference between the QC and CA test results are outside the allowable differences, the reason shall be investigated immediately.

CA Data Analysis

The results of CA testing are evaluated according to the flow chart "Evaluation of CA Test Results", located in the appendix.

QV Tests

The following tests are to be performed in determining product Quality Verification:

- Bulk Specific Gravity of the Mixture (Gmb per AASHTO T 166)
- Maximum Specific Gravity of the Mixture (Gmm per AASHTO T 209)
- Air Voids (Va per AASHTO T 269, calculation)
- Voids in the Mineral Aggregate (VMA per AASHTO R 35)

HMA Compaction – AASHTO T 312

- Preheat specimen molds (charging funnels, spatulas, etc.) to 300F (150C)
- Heat sample, in an open container, to a compaction temperature of 275F ± 5F (132 -138C) in an oven between 285F – 320F (140C – 160C) and for no more than 1 hour. ***Note:*** After quartering to test size, if the mix sample is within the proper compaction temperature range, then the specimen can be compacted without further heating.
- Place specimen protection disc into the bottom of the mold and charge the mold with the mix sample. The sample size should be enough to attain a final specimen height of 115mm ± 5mm and is unique to the mix design (for Wisconsin aggregates and designs a range of 4700 – 4900g is generally appropriate). Charging the mold should be accomplished in one lift action or motion so as to avoid segregating the sample inside the mold (additional funnels or scoop chutes may be used in order to accomplish this)
- Lightly level off the top of the sample and place a specimen protection disc on top
- Load the mold into the SGC and compact to the appropriate Ndes for the mixture type being produced (by applying 600kPa ± 18kPa, at an angle of 1.25 ± .02^{o})
- After compaction is completed the specimen is extruded, protection papers removed, the briq is labeled, and cooling by fan is required for a period of 1hr 45min (not to exceed 2hrs). ***Note:*** if the mixture is extremely fine or tender, then the initial 5-10 minutes of cooling should take place while the specimen is only partially extruded (to aid in handling)
- Height measurements should be recorded and retained with each specimen
- Reheat the mold for a minimum of 5 minutes if reusing for the second specimen

All SGCs being used for QMP specimen preparation shall conform to the requirements for calibration as listed in the Departments Laboratory Qualification Program. Recalibration may be necessary if the testing variation

between labs exceeds allowable differences or when a continued bias exists in the data.

Bulk Specific Gravity (Gmb) AASHTO T 166

Determine bulk specific gravity, Gmb, using AASHTO T166.

Weigh the specimens in air and record (designated this weight as A).

- Immerse the specimens in 77±2F (24C – 26C) water bath for 3 to 5 minutes.
- Weigh in water, and record. (designating this weight as C).
- Surface dry the specimens by blotting quickly with a damp towel and then weigh in air (include any water than may drain from voids in specimens), and record (designating this weight as B).
- Calculate the Gmb to three decimal places (0.001)

$$Gmb = \frac{A}{(B - C)}$$

Determine the average bulk specific gravity for both specimens. If one of the individual specimens deviates by more than ±0.015 from the average, both results are considered suspect and a new set of specimens is to be compacted from the contractor retained sample.

If excessive variability exists between QC and reheated samples, then a Gmb Reheat Correction Factor is to be determined to aid in troubleshooting.

Gmb Reheat Correction Factor (*Calc'd to 0.001*) = Gmb (Unreheated) / Gmb (Reheated)

Then apply the correction factor to the reheated sample by:
Corr Gmb = Gmb (Reheated) * Corr Factor

When comparing the Uncorrected Gmb to the Corrected Gmb, if the difference is less than 0.005, then the correction factor shall not be used.

Maximum Specific Gravity of the Mixture (Gmm) - AASHTO T 209

Determine maximum specific gravity, Gmm, using AASHTO T 209.

- Use the appropriate sample size Figure 5.
- Subject the Gmm sample to the same heating condition and time period as the Gmb material.
- Begin to cool the sample. While sample is cooling, break up sample to pieces no greater than ¼", and continue to cool to an ambient room temperature.
- Place material into a calibrated container and determine the actual dry weight of the sample
- Add 77F (25C) water to cover the sample
- Apply required vacuum for 15 ± 2 minutes, agitating material every 2 minutes (minimum)
- After the vacuum time period, completely fill the container with 77F (25C) water and determine the volume of the sample (Bowl Method: by

suspending the container underwater; Flask Method: by weighing the container filled with water and sample)

- Correct the Gmm with a dryback test procedure or by applying a dryback correction factor if aggregates have a moisture absorption of ≥ 2.0 % (see next subsection).

Calculate the Gmm to three decimal places, 0.001

$$Gmm = \frac{A}{(A + B - C)}$$

Where: A = dry sample wt
B = pycnometer volume (pot + water)
C = pot + water + mix

Dryback Procedure (Corrected Gmm) for Absorptive Aggregates (AASHTO T 209, Supplemental Procedure for Porous Aggregates)

- Run a dryback procedure on Day 1-Sample 1, and determine a dryback correction factor for that test. Average the test dryback correction factor with the design JMF dryback correction factor and apply to the test data for a new Gmm. If the new average correction factor changes the Gmm by less than 0.010 then use the design JMF dryback correction factor until otherwise determined by additional testing.
- Run a dryback procedure every other day of production on the first test sample, or any time there's a change in binder content greater than 0.1%, or a change in component blend percentages greater than 10% (or 20% combined), using the same averaging method as above to validate the original design JMF dryback correction factor.
- If any average dryback correction factor changes the Gmm by more than 0.010, check for math or testing error first, otherwise a new dryback correction factor must be established by running drybacks on the next three samples. Average the new dryback correction factors and establish that average as the new JMF dryback correction factor.

If excessive variability exists between QC and reheated samples, then a Gmm Reheat Correction Factor is to be determined to aid in troubleshooting.

$$\text{Gmm Reheat Correction Factor (}\textit{Calc'd to 0.001}\text{)} = \frac{\text{Gmm (Unreheated)}}{\text{Gmm (Reheated)}}$$

Then apply the correction factor to the reheated sample by:

Corr Gmm = Gmm (Reheated) * Corr Factor

When comparing the Uncorrected Gmm to the Corrected Gmm, if the difference is less than 0.005, then the correction factor shall not be used.

Air Voids (%Va) – AASHTO T 269

The air void ($\%V_a$) determination is a relationship between maximum specific gravity (G_{mm}) and bulk specific gravity (G_{mb}). Calculate to one decimal place.

$$Va,\ \% = \frac{(Gmm - Gmb)}{Gmm} x100$$

Voids In Mineral Aggregate (VMA)

VMA is calculated using the aggregate bulk specific gravity, G_{sb}, from the contractor mix design, the asphalt content (P_b determined from the amount of asphalt being added at the time of sample) and the average SGC specimen bulk specific gravity, G_{mb}, as follows: (calculate to one decimal place, 00.1.)

Note: *100 – Pb = Ps (or % stone)*

$$VMA,\% = 100 - \frac{G_{mb} \times (100 - P_b)}{G_{sb}}$$

Aggregate Effective Specific Gravity, (G_{se})

In the Gse calculation, the volume of the aggregate includes all the aggregate internal void spaces except those that absorb asphalt. Calculate to three decimal places.

$$Gse = \frac{100 - Pb}{\left[\left(\frac{100}{Gmm}\right) - \left(\frac{Pb}{Gb}\right)\right]}$$

Where: Gmm = end of previous days average
Pb = end of previous days tank stick
Gb = binder specific gravity from the mix design

Calculate this Gse at the beginning of each day and use that value for current day's calculations. If there is a change in binder content then recalculate a new Gse with the next available sample (consider it being non-random) and average with the previous Gse:

Where: Gmm = current sample test result
Pb = reflecting the intended change (assumed)
Gb = from the mix design

Note: a change in binder source or grade requires a check of the Gb

Percent Of Asphalt Content (P_b)

Option is to use a plant gauge reading method (as approved by the engineer) and record the reading as close to representing the sample as possible. When calculating the Pb use the following equation:

$$P_b = 100 \times \left(\frac{G_b}{G_{mm}}\right) \times \frac{(G_{se} - G_{mm})}{(G_{se} - G_b)}$$

Where : Gmm = current sample test result
Gse = previous day
Gb = mix design

Additional Formulas and Example Calculations

1. Determining the Asphalt Absorption, **P_{ba}**, for the following:

Given: G_{se} = 2.761
G_{sb} = 2.703
G_b = 1.030

$$P_{ba} = 100 \times \frac{(G_{se} - G_{sb})}{(G_{sb} \times G_{se})} \times G_b =$$

$$100 \times \frac{(2.761 - 2.703)}{(2.703 \times 2.761)} \times 1.031 = 100 \times \frac{0.058}{7.463} \times 1.031 = \mathbf{0.8}$$

2. Determining the Effective Asphalt Content, $\mathbf{P_{be}}$, of the asphaltic mixture for the following:

   Given: P_b = 5.3
   P_{ba} = 0.8
   P_s = 94.7

$$P_{be} = P_b - (\frac{P_{ba}}{100}) \times P_s = 5.3 - \left(\frac{.8}{100}\right) \times 94.7 = \mathbf{4.5}$$

3. Determining the Percent Voids Filled with Asphalt (**VFA)** for the following compacted mixture:

   Given: VMA = 14.4
   V_a = 3.7

$$VFA = 100 \times \frac{(VMA - V_a)}{(VMA)} = 100 \times \frac{(14.4 - 3.7)}{(14.4)} = \mathbf{74.3}$$

4. Determining the Dust to Binder Ratio (or DP: Dust Proportion)

   Given: Pbe = 4.5
   %passing 0.075 = 5.0

$$\text{Dust to Binder Ratio} = \frac{\%\ \text{passing}\ 0.075}{\text{Pbe}} = \frac{5.0}{4.5} = 1.1$$

Field Adjusted JMF

The JMF may be adjusted in the field based on production test results according to the procedures in WisDOT method 1559.

When the JMF asphalt content is changed by 0.2% or more (start new running average for Gmm), the compaction Target Maximum Density for the day of the target change shall be calculated using the most recent Gse, and %AC (Pb) for the new JMF and Gb (AC Sp. Gr.) at 77/77 F from the mix design as follows:

Field TSR Tests

Determine the Tensile Strength Ratio according to the procedures in ASTM Method D 4867.

After manufacturing the specimens, they may be tested in an off site laboratory.

Use distilled water for saturating and soaking the test specimens.

Aggregate And Rap Sampling And Testing

In addition to testing the hot mix asphalt, the specification requires the contractor to test the aggregates prior to incorporation to the mix.

Sample Time for Aggregate Stockpile Gradations & RAP Extraction

Take the first sample after the stockpiles have been established at the plant and prior to the first day of production. Additional samples shall be obtained at the required daily frequency at a time during the day convenient to the contractor.

Aggregate Stockpile Samples

The minimum test sample size shall be 2000 gm for coarse aggregate and 500 gm for fine aggregate.

The results of the stockpile gradations shall be recorded on gradation running average calculation sheets. For each aggregate, the results for four key sieves (those sieves with the greatest potential for variability) need to be maintained.

Rap Stockpile Samples

The minimum test sample size shall be determined from extracted aggregate gradation size per AASHTO T164. That has been divided into aggregate gradation numbers as follows:

Nominal Max Size (mm)	Minimum Weight of Test Sample (grams)
25.0	3000
19.0	2000
12.5	1500
9.5	1000

When test results indicate that a change has occurred in the RAP asphalt content, a change in the design RAP asphalt percentage may be requested by the contractor or the engineer. The request shall include at least two recent RAP extractions from the contractor's mixture design laboratory. The requested change will be reviewed for the Department by a Certified Asphalt Technician III, and a revised JMF can be issued.

Blended Aggregate Samples

The minimum belt sample size shall be 50 pounds.

The minimum test sample size which is split from the belt shall be as specified below:

Nominal Max Size (mm)	Minimum Weight of Test Sample (grams)
25.0	5000
19.0	3000
12.5	2000
9.5	1000

The minimum Field Extraction sample size quartered from the mixture sample shall be as specified below:

Nominal Max Size (mm)	Minimum Weight of Test Sample (grams)
25.0	3000
19.0	2000
12.5	1500
9.5	1000

Optional Pretested Aggregate And Rap Stockpile Production Testing

The specification allows the engineer to waive testing of the aggregate stockpiles during HMA production provided the contractor provides data from testing conducted during the production of the stockpiles.

Personnel Requirements

The contractor shall provide at least one Certified Aggregate Technician I to conduct the sampling and testing for stockpile production. Sampling shall be conducted by a certified technician or by plant personnel under the direct observation of a certified technician. All testing, data analysis and data posting will be performed by the Certified Aggregate Technician I or by an Assistant Certified Technician under the direct supervision of the level I technician. Certification shall be in accordance with the Department's Highway Technician Certification Program.

Laboratory Requirements

The contractor shall have access to a suitable laboratory to perform quality control testing. The laboratory shall be located within a reasonable distance of the stockpile site.

The laboratory shall contain the equipment and supplies necessary to meet the requirements of the test methods herein identified. The laboratory shall be set up prior to production.

The engineer shall be allowed to inspect measuring and testing devices to confirm both calibration and condition. The contractor shall calibrate all testing equipment in accordance with Procedure 4-15-32 and shall maintain a record of calibration results at the laboratory.

Sampling and Testing for Aggregate and RAP Stockpile Production

The contractor shall sample and test randomly selected samples at a frequency not less than that indicated:

Tests

Aggregate Stockpile Gradation (AASHTO T-11 and T-27)

Tests shall be conducted on aggregate material from either the belt or stockpiles. One sample selection process shall be used throughout a project unless otherwise approved by the engineer.

Frequency

Daily Individual Stockpile Production (Tons)	Number of Tests(per day)
0 - 1500	1
1501+	2

When 2 tests are required, the planned daily production shall be divided into two even increments.

HMA Quality Management Program Documentation

The contractor shall be responsible for documenting all observations, records of inspection and test results on a daily basis. Results of observations and records of inspection shall be noted as they occur in a permanent field record. The testing records and control charts shall be available in the Qc laboratory at the asphalt plant.

Standardized control charts shall be maintained by the contractor. Test results obtained by the contractor shall be recorded on the control charts the same day the tests are conducted.

The following data shall be recorded on the standardized control charts for all randomly selected production samples tested:

Aggregate Gradation Tests (Sieves - % Passing). Sieve sizes shall be:

1" (25.0mm), 3/4"(19.0mm),1/2"(12.5mm), 3/8"(9.5mm), # 4 (4.75mm), #8(2.36mm), # 16 (1.18mm), # 30 (600µm), # 50 (300µm) # 100 (150µm) and # 200(75µm). Report only those sieve sizes pertaining to the size and type of material being produced.

Documentation

Records

QC Records

- In addition to the requirements of the “Records” subsection of the standard specification, the contractor will provide an accumulative tonnage value to the engineer on a daily basis.
- The QC team posts results from any CA or QV testing on the appropriate chart.

CA Records

- When CA testing is completed a CA form is filled out and sent to the QV team (see example form in the appendix).
- Results from CA testing are posted on the QC charts for the appropriate property. The CA data point should be represented by an “X” (blue).

QV Records

- Results of QV testing are posted to the QC charts for Air Voids and VMA and represented with a red (X).

Control Charts

QC Control Charts

In addition to the gradation, asphalt content, Gmb, Gmm and Air Voids charts, the contractor will provide data, on a standard control chart, for VMA .

Quality Verification Program

Monitoring Contractor QMP

Pre-Construction

Obtain and verify the following information:

- WisDOT test number of the quality test report for the aggregate source(s) being used. If source quality testing hasn’t been completed, notify the department’s Bureau of Highway Construction’s Laboratory.
- A copy of the Contractor's mix design, the review report, if available, from department’s Materials Tracking System, and the contract special provisions.
- Verify that the QC team personnel have the proper certifications.

- Verify that the QC Laboratory facility is WisDOT qualified and has the equipment required by the QMP specification (inclusive of communication devices).

Review any procedures for determining reheat correction factors and for the Gmm dry back correction factor (if applicable).

Discuss any necessary calibrations, or pending recalibrations, for the gyratory compactor and what procedure will be used.

During Production

During production, the QV Team should, as often as they feel necessary:

1. **Random Sampling:**
    a. Check the QC procedures for proper random number generation for all samples.
    b. Make sure that the QC team is aware that they are not to inform the plant when the random sampling will be done prior.
2. **Samples:**
    a. Insure all required samples are being taken for mixture properties and blended aggregate gradations.
    b. That proper sampling and splitting procedures are being used and the field sample size is large enough for the minimum required testing.
    c. Stockpile samples are taken and tested for aggregates and reclaimed asphaltic pavement (RAP) when applicable.
    d. Tensile strength ratio (TSR) tests have been conducted at proper intervals when using antistripping agents.
    e. That the retained samples (mix and blended aggregate) are properly labeled and stored in a dry protected area.
3. **Testing:**
    a. Observe the reduction of the field samples to test size.
    b. Observe the testing procedures paying attention to the particulars; such as temperature of test samples before compaction, compaction efforts, times allotted between tasks, dry backs, etc.
    c. Review data calculations. (Adjusted with the calibration correction factors when applicable)
4. **Control Charts**:
    a. Check to see that required control charts are present and up to date.
    b. Check to see that control limits and warning bands are accurately drawn.
    c. Check to see that the proper values are being plotted correctly.
5. **Documentation:**
    a. Check to see that records of compliance are being documented and are up to date.

b. Check to see that adjustments to mixtures and JMF changes are noted.

c. Check to see that records have been provided to the QV team on a daily basis.

Verification Sampling

All product verification sampling is the responsibility of the department's QV Team.

- **Aggregates:** The QC and the QV Teams will come to a consensus on where aggregate samples will be procured. The aggregates shall be sampled in accordance with the method allowed in Procedure 4-25-50 that fits the situation. If none of the allowed sampling methods fits the situation, one shall be written by the QMP Team and posted in the QC laboratory.

  The QC team is required to procure "stockpile" samples from each individual feed bin or stockpile at the frequency required in the QMP. The QV Team needs only to insure this sampling is being accomplished.
- **Design Mixtures:** Samples from the truck box will be taken by a member of the contractor QC team, and directly observed by the QV team member. In addition, if the initial split (QV / QV-retained) is performed by the contractor, it is also to be directly observed by the QV team member.

The QV Team shall determine and document random sampling for mixture verification samples by any or all of the following methods:

- Production tonnage
- Specific week during production
- Specific day-of-the-week during production
- Time-of-day

If some other method is used, it should be mutually agreed upon between the QV and QC teams prior to taking place.

The contract language specifies "two mixture production days" after the sample has been obtained by the contractor as the time within which the QV personnel must respond to the QC team relative to the agreement of data results. The intent is to provide information and feedback to the QC team as soon as practical in case there is data disagreement.

If the QV mixture sample temperature is 230 degrees F (110C) or higher when delivered to the testing facility, quartering may start immediately. If the temperature is below 230F (110C), place in a 250F (121C) oven, until workable for quartering, but not to exceed two hours.

Determining Acceptable Verification Parameters

Whenever a flag has been raised by disagreement of QV test results with the defined acceptable parameters, immediate investigation will occur using:

- Additional testing

- Troubleshooting
- Dispute resolution actions

Additional Testing

- WisDOT's Bureau of Highway Construction Laboratory is to test QV retained and nearest backward QC Retained sample.

Example:

QV sample taken after QC test 5-3 falls outside acceptable parameters, then the WisDOT – BHC Lab tests retained portion of QV, along with retained portion of QC sample 5-3. If that retained sample doesn't exist then the next nearest backward sample is 5-2, etc. If there are no backward retained QC samples, then liability for that mixture may include back to production start-up.

- QV team to provide CA testing on any forward QC samples as soon as practical, and at a minimum frequency of 1 in 10 until the QC and QV team mutually agree that the problem has been solved in a forward direction.

Example:

QV sample taken after QC test 5-3 falls outside acceptable parameters, QV team tests retained portion of QC sample 5-4 or 6-1 or 6-2, etc. If production has continued after a flag has been raised by initial QV testing, the QV team determines (may be non-random) which retained sample to represent the first forward testing for compliance with the 1 in 10 frequency.

Troubleshooting

The following points are to be considered and re-checked:

- Calculations
- QC data trends
- Any CA testing trends or bias
- Equipment calibration records
- Sampling and Splitting observations/notes
- Proper use of reheat correction factors

Dispute Resolution

For the test results of the QV Retained portion, the contract language specifies "two working days" after receipt of the sample. The receipt day refers to receipt of the sample at the department's Bureau of Highway Construction AASHTO accredited laboratory. The intent is to provide information and feedback to the QC/QV team as soon as practical.

At the completion of Dispute Resolution testing (QV retained and nearest backward QC Retained) the WisDOT-Bureau of Highway Construction AASHTO accredited laboratory personnel dealing with asphalt mix designs will determine a range of liability using, but not limited to, the following information:

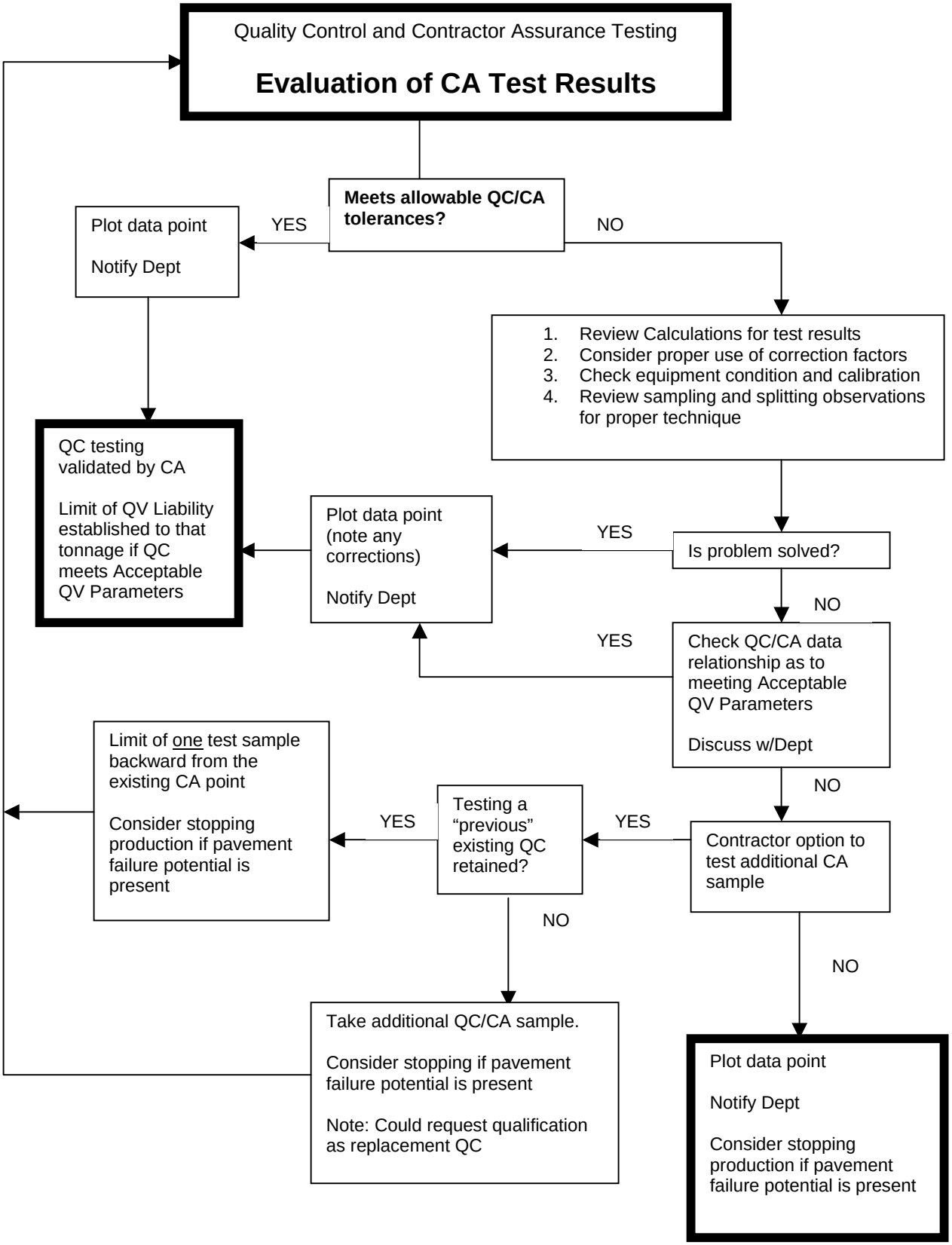
- Project QC data
- Project CA data
- Any additional forward testing
- JMF changes and cause for change

- Distance differences between QV, QC and CA testing points for the project (single and running averages)
- Affected mixture properties in conjunction with intended application
- Design mixture history

In determining liability and defining unacceptable or unsatisfactory materials, the department's Bureau of Highway Construction AASHTO accredited laboratory personnel dealing with asphalt mix designs, will provide documentation to both the QV and QC teams recommending tonnages to be affected. In the event that the range of liability is determined to be at the QV tonnage point (isolated problem), a standard pay adjustment equivalent to 25 ton will be assessed, unless QMP Quality Control pay adjustments are controlling (460.2.8.2.1.7 (6)). There is no intent to use multiple pay adjustments but the lowest percent pay will supersede others.

The QV team will further complete documentation by determining the dollar amount for any affected mixture tonnage and will forward that information to the QC team within 15 working days.

Evaluation of CA Test Results



Evaluation of QV Test Results